



Background Investigation Sampling and Analysis Plan

Columbia Falls Aluminum Plant
Columbia Falls, Flathead County
Montana

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Preliminary - Under EPA and MDEQ Review

Acronym List

<u>Acronym:</u>	<u>Definition:</u>
AOC	Administrative Settlement Agreement and Order on Consent
ASTM	American Society for Testing and Materials
BERA WP	Baseline Ecological Risk Assessment Work Plan
BHHRA WP	Baseline Human Health Risk Assessment Work Plan
BMA	Block Management Area
BSB	Background Soil Boring
BSDP	Background Sediment Point
BSWP	Background Surface Water Point
BTV	Background Threshold Value
CEM	Conceptual Exposure Model
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFAC	Columbia Falls Aluminum Company, LLC
COC	Chain of Custody
COPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DQO	Data Quality Objectives
DSR	Data Summary Report
DUP	Field Duplicate
EB	Equipment Blank
FB	Field Blank
FS	Feasibility Study
FSP	Field Sampling Plan
FT-BLS	Feet Below Land Surface
GIS	Geographic Information System
GPS	Global Positioning System
GW	Groundwater
LL	Low Level
MBSI	Montana Background Soils Investigation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ORP	Oxygen Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbon
PID	Photoionization Detector
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Protection Plan
RI	Remedial Investigation

<u>Acronym:</u>	<u>Definition:</u>
SAB	Suspended and Bedded Sediment
SAP	Sampling and Analysis Plan
SD	Sediment
SLERA	Screening Level Ecological Risk Assessment
SO	Soil
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compounds
SW	Surface Water
TAL	Target Analyte List
TCL	Target Compound List
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
UCL _{mean}	Upper Confidence Limit of the Mean
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Compounds

1. Introduction

On behalf of Columbia Falls Aluminum Company, LLC (CFAC), Roux Environmental Engineering and Geology, D.P.C. (Roux), has prepared this Background Investigation Sampling and Analysis Plan (Background SAP) as part of the Phase II Site Characterization and ongoing Remedial Investigation/Feasibility Study (RI/FS) of the Superfund Site referred to as Anaconda Aluminum Co. Columbia Falls Reduction Plant (a/k/a Columbia Falls Aluminum Plant), located two miles northeast of Columbia Falls in Flathead County, Montana (hereinafter, "the Site"). The RI/FS is being conducted pursuant to the Administrative Settlement Agreement and Order on Consent (AOC) dated November 30, 2015, between CFAC and the United States Environmental Protection Agency (USEPA) (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Docket No. 08-2016-0002). The RI/FS Site Boundary is presented as Figure 1. This Background SAP was developed in accordance with the Scope of Work included with the RI/FS Work Plan for the Site (Roux Associates, 2015a) and the Phase II Site Characterization Sampling and Analysis Plan (Phase II SAP) (Roux Associates, 2018). A detailed description of the Site, its operational history, and the results of historical investigations and the Phase I Site Characterization was provided in previous documents prepared as part of the RI/FS, including but not limited to the RI/FS Work Plan (Roux Associates, 2015a), Phase I Site Characterization Sampling and Analysis Plan (Phase I SAP) (Roux Associates, 2015b), Phase I Site Characterization Data Summary Report (Phase I DSR) (Roux Associates, 2017a), Screening Level Ecological Risk Assessment (SLERA) (Roux Associates, 2017b), and the Groundwater and Surface Water Data Summary Report (Roux Associates, 2017c).

The term "background" as used in this document refers to concentrations of chemicals at locations that are unaffected by any current or past Site activities. Background includes concentrations of both naturally occurring and anthropogenic chemicals. Concentrations of chemicals may be naturally occurring in the environment in forms that have not been influenced by human activity; while anthropogenic background concentrations may be natural and human-made substances present in the environment as a result of human activities (USEPA, 2002a, b, c).

The purpose of the Background Investigation is to characterize the concentrations of contaminants of potential concern and contaminants of potential ecological concern (collectively referred to as COPCs) in areas outside the Site that are unaffected by historic Site operations or other readily identifiable, anthropogenic sources of contamination.

The goals and data quality objectives (DQOs) specific to the Background Investigation are provided in Section 2.0. The Field Sampling Plan (FSP) that describes the data gathering and sampling activities such as sample location and rationale, and the associated fieldwork procedures is provided in Section 4.1. The work will be performed in accordance with the Quality Assurance Project Plan (QAPP) that was provided as Part 2 of the Phase II SAP (Roux Associates, 2018).

This Background SAP has been developed in general accordance with the USEPA RI/FS Guidance (USEPA, 1988), USEPA Guidance for Quality Assurance Project Plans (USEPA, 2002a), and the Guidance on Systematic Planning Using the Data Quality Objectives Process (USEPA, 2006). This Background SAP also considers USEPA guidance regarding background studies including the OSWER Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites (USEPA, 2002b), OSWER Role of Background in the CERCLA Cleanup Program (USEPA, 2002c), and OSWER Selecting and Using Reference Information in Superfund Ecological Risk Assessments (USEPA, 1994).

2. Data Quality Objectives and Criteria for Measurement Data

The Background Investigation will be performed in general accordance with the QAPP provided in the Phase II SAP (Roux Associates, 2018). DQOs specific to the Background Investigation are provided in the remainder of this Section 2.0. DQOs for this Background Investigation were not provided in the Phase II SAP (Roux Associates, 2018) and thus are being provided as part of this Background SAP.

The Scope of Work described in this Background SAP and the Phase II SAP was developed in a manner consistent with USEPA's "Guidance on Systematic Planning Using the Data Quality Objective Process" (USEPA, 2006). The DQO process is designed to clarify the objectives of data collection and maximize efficiency during data collection. It consists of a multi-step, iterative process that ensures that the type, quantity, and quality of environmental data used in the decision-making process are appropriate for its intended application.

The following steps were completed as part of the DQO process in general accordance with the USEPA guidance:

- Define the Problem;
- Identify the Goals / Decisions of the Study;
- Identify Information Inputs;
- Define the Study Boundaries;
- Develop the Analytical Approach;
- Specify Performance or Acceptance Criteria; and
- Develop the Plan for Obtaining Data.

The remainder of this element summarizes the DQO process as it relates to the Background Investigation.

2.1 Step 1: Define the Problem

The RI/FS Work Plan and the results of the Phase I Site Characterization completed in 2017 provide the background information and relevant existing Site data to define the problem. The Phase I Site Characterization program was designed to identify and/or confirm source areas and broadly characterize the nature and extent of associated COPCs across the Site and around Site features. Site features are presented on Figure 2.

Results of the Phase I Site Characterization indicated that cyanide, fluoride, and polycyclic aromatic hydrocarbons (PAHs) are the primary COPCs found within the Site. These were presumed to be the primary COPCs at the Site based upon knowledge of historical Site operations and the distribution of concentrations observed in the various media around source areas and Site features. Although cyanide, fluoride and PAHs were determined to be Site related, these COPCs may also be present within the background environment. In addition to the primary COPCs, metals were detected frequently across the Site in most soil, surface water, and sediment samples. Metals are also known to occur frequently in the background environment. A summary of key findings from the Phase I Site Characterization regarding the nature and extent of COPCs as it relates to the problem definition is provided in Section 2.1.1 of the Phase II SAP.

The results of the Phase I Site Characterization were used in the development of the draft Baseline Human Health Risk Assessment Work Plan (BHHRA WP) and draft Baseline Ecological Risk Assessment Work Plan (BERA WP) (EHS Support, 2017a, b) to perform a preliminary screening to identify the COPCs which may pose a potential threat to human health and the environment. Based upon the results of the preliminary screening, it is recognized that several of the COPCs at the Site have the potential to occur in the background environment. Therefore, developing an understanding of the occurrence and concentrations of these COPCs in background reference areas will be necessary to frame the results of the risk assessment with respect to these COPCs.

2.2 Step 2: Identify the Goals / Decisions of the Study

The Phase II Site Characterization program was designed to address outstanding data gaps in order to complete the RI and conduct a risk assessment. The adequacy of Phase I Site Characterization data collected to represent background conditions was identified as an uncertainty in the SLERA (Roux Associates, 2017b), and is further described as a data gap in the BERA WP (EHS Support, 2017b).

As stated in the Phase II SAP, the results of the Phase II Site Characterization, including the Background Investigation, will be used to refine the CSM/Conceptual Exposure Model (CEM) provided in the BHHRA WP and BERA WP (EHS Support, 2017a, b), as necessary. At the conclusion of the Phase II Site Characterization, the risk assessment will be completed in accordance with the procedures outlined in Section 6.0 of the RI/FS Work Plan (Roux Associates, 2015a) and in accordance with the BHHRA WP and BERA WP (EHS Support, 2017a, b).

The following objectives were established for the Background Investigation and were derived from the DQO process.

- Identification of reference locations that will be suitable for characterization of background concentrations of COPCs in soil, sediment and surface water; and
- The collection of a sufficient number of soil, sediment, and surface water samples from the reference locations to develop a statistically-robust background data set for use in framing the results of risk assessment with respect to COPCs that also exist in background areas.

The Phase II Site Characterization has been designed to fill data gaps as necessary to complete the BHHRA, BERA, and FS. The absence of an adequate background dataset was identified as a data gap, and therefore, the goal of this Background Investigation is to develop a statistically-robust background dataset in order to frame the results of the risk assessment with respect to COPCs found to exist within the background environment. This goal forms the basis for development of the following decision questions and statements.

- **Question 1:** What are the concentrations of select COPCs (cyanide, fluoride, PAHs, and metals) in reference area surface soil, surface water, and sediment?

Estimation Statement: Develop an adequate sample dataset to calculate the upper confidence limit of the mean (UCL_{mean}) and the background threshold value (BTV) of COPCs in each background reference area.

- **Question 2:** Are the COPC concentrations in soil, surface water and sediment within the Site associated with a Site-related source or are they associated with background?

Decision Statement: Determine if the COPC concentrations in Site soil, surface water, and sediment exceed the COPC concentrations in the reference areas; and therefore, are at least in part, attributable to a Site-related source.

If COPC concentrations at the Site are not significantly different from background concentrations, the COPC concentrations may represent regional conditions that are not related to Site activities. Background sample reference areas should have similar characteristics as the Site, but should not have been affected by activities on the Site. A discussion of the considerations in selection of the background reference area sampling locations and a preliminary identification of the area proposed for sampling is provided in Section 3.0.

2.3 Step 3: Identify Information Inputs

A description of the new data required to address each of the DQO questions and statements provided in Section 2.2 is summarized below.

- **Estimation Statement:** *Develop an adequate sample dataset to calculate the UCL_{mean} and the BTV of COPCs in each background reference area.*

In order to estimate UCL_{mean} and BTV COPC concentrations, soil, surface water, and sediment samples will be collected within the background reference locations. Background sample reference areas should have similar characteristics as the Site, but should not have been affected by activities on the Site. Considerations for background reference areas and the rationale for the Background Investigation proposed reference areas are provided in Section 3.0. Ten samples are proposed for each reference area to facilitate statistical evaluation of the data, as recommended by ProUCL and as described in Section 4.2.2. The samples will be analyzed for cyanide, fluoride, semivolatile organic compounds (SVOCs) (including PAHs), and metals, which are the constituents of interest for the background study (as described in Section 4.1). Temporal variability in the data will be considered when planning for surface water sample collection to collect a representative range of data. Temporal variability considerations are further described along with the study boundaries in Section 2.4.

- **Decision Statement:** *Determine if the COPC concentrations in Site soil, surface water, and sediment exceed the COPC concentrations in the reference areas; and therefore, are at least in part, attributable to a Site-related source.*

The UCL_{mean} of COPC concentrations within the Site will be compared against the UCL_{mean} of COPC concentrations in background reference locations. Hypothesis testing will be performed utilizing ProUCL. Details regarding the hypothesis testing and the statistical approach are provided in Section 2.5. BTVs will also be developed utilizing ProUCL.

2.4 Step 4: Define the Study Boundaries

Background reference area sampling for soil, surface water, and sediment will occur outside of the RI/FS Site boundary. The locations were selected such that Site-related impacts and potential impacts due to other historic industrial or commercial operations are not expected to occur in the reference locations. The proposed locations and considerations in selecting the locations are described in Sections 3.3, 3.5, and 3.7.

Candidate background locations will be distal to industrial operations at the Site and have no known waste materials present. Due to the potential for historical atmospheric deposition of suspected COPC to, identified candidate background locations will target areas upwind of the Site based upon the prevailing wind direction in the vicinity of the Site. Soil type and soils derived from similar geologic sources are the primary consideration when choosing soil background reference locations. Surface water and sediment sampling locations will target areas hydraulically upgradient of the Site. Sections 3.2, 3.4, and 3.6 describes the proposed soil, surface water, and sediment reference areas that were selected based on the DQO process.

Soil sampling will be conducted in three background reference areas which demonstrate similar chemical and physical properties as the soil types on Site. Based on the review of surficial geology and surface soil type reviews for the Flathead Valley and the Site described in Section 3.2, the following three primary soil

types will be utilized for background soil reference areas; glacial till and alluvium, fluvial deposits, and mountainous land with glacial deposits. Soil will be collected from the surficial depth interval (0-0.5 feet below land surface [ft-bls]).

Surface water and sediment will be collected from upgradient locations of the Flathead River and Cedar Creek. In order to best represent background conditions for surface water and sediment, surface water and sediment samples will be collected upgradient of the Site in the Flathead River and upgradient of the Site within the headwaters north of Cedar Creek. Surface water samples will be collected at a depth of approximately 60 percent of the total water column depth and no greater than a maximum water depth of two feet. Sediment will be collected from 0-0.5 ft immediately beneath the sediment-surface water interface. Soil, surface water, and sediment sampling details are included in Section 4.2.2, 4.2.3, and 4.2.4.

The background sampling activities are anticipated to occur from June 2018 to October/November 2018. Background surface soil sampling will occur in June 2018 coinciding with onsite soil sampling. As discussed in Section 3.3 and further described in the Phase II SAP (Roux Associates, 2018), surface water conditions vary in the Flathead Valley depending on seasonal fluctuations. Two rounds of background surface water sampling will occur; one during high water season in June 2018, and one during low water season in October/November 2018 to evaluate temporal variability. Background sediment samples will be collected during the low water conditions in October/November 2018 such that the Flathead River is receiving groundwater input during this time period. These sampling events correspond to the same timeframe as the onsite surface water and sediment sampling events.

2.5 Step 5: Develop the Analytical Approach

The activities described in Section 4.2 were developed to generate the types and quantity of data required to address the decision statement and estimation statements specified in Sections 2.2 and 2.3. Analytical data collected during the background investigation will be validated, compiled, and tabulated in the project database for comparison and statistical analysis. The analytical approach to address each decision and estimation statement is described below.

- **Estimation Statement:** *Develop an adequate sample dataset to calculate the UCL_{mean} and the BTV of COPCs in each background reference area.*

The UCL_{mean} for the COPCs in various media and reference areas, and the BTV for the background dataset, will be calculated using the most recent version of USEPA's ProUCL software, version 5.1.002 (5.1) and in accordance with the ProUCL guidance document. All aspects of data evaluation, data transformation, data identification, and the data treatment of outliers will be documented and included within the Phase II Data Summary Report, along with the ProUCL output as an appendix to each data report.

- **Decision Statement:** *Determine if the COPC concentrations in Site soil, surface water, and sediment exceed the COPC concentrations in the reference areas; and therefore, are at least in part, attributable to a Site-related source.*

For each COPC, the UCL_{mean} concentration of onsite samples for each exposure area will be compared to the UCL_{mean} concentration of the respective background samples. If the Site UCL_{mean} concentrations exceed the background UCL_{mean} concentrations, then the COPC will be treated as potentially Site-related. Otherwise, if the Site UCL_{mean} concentrations do not exceed the background UCL_{mean} concentrations, the COPC will be treated as background-related. For all Site and background data, duplicate samples will be averaged with the respective parent samples.

For all COPCs determined to be potentially Site-related, one-sided two-sample hypothesis testing will be performed comparing background data to onsite data by exposure area. The hypotheses for each test will follow Background Test Form 1 (USEPA, 2002c) as indicated below:

The null hypothesis, H_0 : The mean COPC concentration in samples from the exposure area is less than or equal to the mean concentration in the respective background area.

The alternative hypothesis, H_A : The mean COPC concentration in samples from the exposure area is greater than the mean concentration in the respective background area.

In other words, rejection of the null hypothesis in favor of the alternative hypothesis provides statistical evidence that the concentrations found in the exposure area exceed background. The concentrations found in the exposure area are considered equivalent and comparable to those of the background area if the hypothesis test fails to reject the null hypothesis.

To determine which hypothesis test will be utilized for each COPC, normality tests will be conducted. If a COPC within an exposure area and its respective background data are normally distributed, a student t-test will be performed; if both sample sets are not normally distributed, a nonparametric test such as the Gehan test will be performed. ProUCL 5.1 will be utilized for all calculations, plots, and hypothesis testing.

2.6 Step 6: Specify Performance or Acceptance Criteria

Performance or acceptance criteria is addressed by an assessment of potential decision error and uncertainty evaluation; as well as by the Quality Assurance/Quality Control (QA/QC) aspects of the project.

2.6.1 Decision Error Limits and Uncertainty Evaluation

As described in Section 2.5, the sampling plan for the background study was developed based on a probabilistic design, which is one of the accepted methods described in USEPA guidance on sampling design (USEPA, 2002b). With a probabilistic sampling design, decision error limits and uncertainty is evaluated through the use of hypothesis testing and confidence levels.

The potential Type 1 decision error to be avoided in this instance is that a COPC would be dismissed as a Site-related COPC when in fact it is Site-related. A Type I error results from rejecting the null hypothesis when in fact the null hypothesis is true (a false positive). A Type II error results from failure to reject the null hypothesis when the null hypothesis is in fact false (a false negative). As detailed in the ProUCL Technical Guide, when using the Background Test Form 1, a Type II error is the more serious offense because it threatens the protection of human health and the environment. Therefore, the upper bounds on the decision error rates are 10% and 20% for Type II and Type I errors, respectively; the power of the test must be greater than or equal to 90%, and the confidence level must be greater than or equal to 80%.

If a hypothesis test is deemed inconclusive at the target levels of power and confidence, additional analyses will be conducted for that COPC in that exposure area. For soil areas, this may include combining background reference areas if two-sided hypothesis testing to compare the reference areas to each other shows them to be equivalent and comparable with respect to that COPC. The additional analyses may also include point by point comparisons to the BTV.

Following preliminary analyses, the data will be reviewed for outliers utilizing Dixon's or Rosner's outlier tests (dependent on sample size) as well as visual aids including box plots and Q-Q plots. The hypothesis testing will be repeated excluding outliers, and any difference in results will be noted. The project team will assess

the influence of outliers and use best judgement to decide the proper disposition of outliers. ProUCL 5.1 will be utilized for all calculations, plots, and hypothesis testing.

2.6.2 Additional Performance or Acceptance Criteria

Quality assurance / quality control, precision, accuracy, sensitivity, completeness, representativeness, and comparability will all be consistent with the performance or acceptance criteria outlined in the Phase II SAP (Roux Associates, 2018).

2.7 Step 7: Develop the Plan for Obtaining Data

The field sampling plan generated to collect the necessary data to meet the DQOs described above is presented in Section 4.1 of this Background SAP. The locations and numbers of sampling points associated with each type of sampling activity were selected to be able to satisfy the decision and estimation statements presented in Sections 2.2 and 2.3.

Soil data collection will occur in three reference areas to evaluate background concentrations in varying types of soil conditions that are similar to the Site. Based on the review of surficial geology and surface soil type reviews for the Flathead Valley and the Site described in Section 3.1, glacial till and alluvium, fluvial deposits and riverwash, and mountainous land with glacial deposits are the primary soil types onsite, and soil reference areas will be selected based on these soil types. A minimum of ten soil samples will be collected in each reference area in an effort to ensure the sample size is sufficient to calculate UCL_{mean} and BTV concentrations in each reference area, as recommended by ProUCL guidance. Soil sampling locations in each reference area will be randomly generated in Geographic Information System (GIS) to meet the probabilistic sampling design.

Surface water and sediment data collection will occur in two reference areas; upstream within the Flathead River and upstream within Cedar Creek to evaluate background concentrations in conditions that are similar to surface water features at the Site. The rationale for these sample locations are further described in Section 3.4 and 3.6. A minimum of ten surface water and sediment samples will be collected in each reference area in an effort to ensure the sample size is sufficient to calculate UCL_{mean} and BTV concentrations in each reference area, as recommended by ProUCL guidance. Surface water samples will be collected during high and low water season to evaluate seasonal changes. As described in the Phase I DSR (Roux Associates, 2017a) and in Section 3.4, the high-flow and rocky substrate of the Flathead River do not allow for frequently identified areas of depositional areas for sediment collection. Therefore, sediment samples will be collected randomly in areas that have depositional sediment within the bounds of the reference areas described in Section 3.4. Surface water and sediment sampling locations in each reference area will be randomly generated in GIS to meet the probabilistic sampling design.

3. Reference Area Considerations and Selection

Background sample reference areas should have similar characteristics as the Site, but should not have been affected by activities on the Site. The physical, chemical, and biological characteristics at the Site are described in detail in previous Site work plans and reports, including the RI/FS Work Plan (Roux Associates, 2015), Phase I DSR (Roux Associates, 2017), Groundwater and Surface Water Data Summary Report (GW/SW DSR) (Roux Associates, 2017), Draft Baseline Ecological Risk Assessment Work Plan (Draft BERA WP) (EHS Support, 2017), and Phase II SAP (Roux Associates, 2018).

The following sections provide a summary of the key Site conditions that were considered in the identification, evaluation, and selection of background reference areas for soil across the Site, surface water / sediment in Cedar Creek, and surface water / sediment in the Flathead River. Soil reference area considerations and selections are described in Section 3.1 and 3.2. Surface water and sediment sample reference area considerations and selections are described in Sections 3.3 through 3.5.

3.1 Soil Considerations

The Site is located within the northeast section of the Kalispell Valley, which is part of the larger Northern Rocky Mountain Physiographic Province (Fennemen, 1931). The Kalispell Valley runs northwest to southeast and is approximately 15 miles wide in the northern section near the Site. Based on data collected by the Western Regional Climate Center (WRCC, 2018), prevailing winds in the area, as measured at Glacier Park International Airport, are generally from the south and south-southeast.

The mountains bordering the Kalispell Valley are comprised predominantly of metamorphosed Precambrian sedimentary rock of the Ravalli group, lower belt series (Konizeski et al., 1968). The rock is typically gray to greenish-gray argillite and light gray quartzite. Based on interpretation of the well logs from the Site, depth to bedrock is estimated to vary from 150 feet to greater than 300 feet across the majority of the Site depending on the proximity to the neighboring mountains and the Flathead River. In areas to the east of the Site near Teakettle Mountain, depth to bedrock is likely less than 150 ft. In the southern portion of the Site near the Flathead River, depth to bedrock may be significantly deeper than 300 feet. On a Site-wide scale, the general slope is in the south-south west direction towards the Flathead River.

The stratigraphy immediately beneath the Site varies locally due to the heterogeneous nature of glacial and alluvial deposits. Generalized geologic cross sections depicting the subsurface stratum beneath the Site based on the existing geologic boring logs are provided in the Phase I DSR (Roux Associates, 2017a). Based on the cross sections and Site well logs, glacial till, glaciolacustrine, and glacial outwash deposits are inferred to exist beneath the Site. Recent alluvial deposits overlying the glacial stratigraphy are found to exist near the southern border of the Site, in the vicinity of the Flathead River. The existing geologic logs indicate that glacial till is prevalent in the northeast area near Teakettle Mountain.

Surficial geologic maps were reviewed to refine the understanding of the Flathead Valley geologic formations and surficial soil types and how they relate to the Site. Figure 3 presents a geologic map of the Flathead Valley in the vicinity of the Site. This map was generated based on the Geologic and Structure Maps of the Kalispell Quadrangle, Montana, and Alberta and British Columbia (Whipple, et al., 1992). Figure 3 also presents the Site boundary in reference to surficial geology in the Flathead Valley. Consistent with the findings from the Phase I Site Characterization, the geologic formations occurring at land surface across the Site include mostly: 1) glacial and fluvio-glacial deposits (Pleistocene) (Qgr); 2) alluvial deposits (Holocene)

(Qal); and 3) the Revett Formation (Middle Proterozoic) (Yr) which is expressed at the surface as Teakettle Mountain.

Surficial soil types within the Flathead Valley were also reviewed using the United States Department of Agriculture Natural Resources Conservation Service Web Soil Service (<https://websoilsurvey.nrcs.usda.gov>). Figure 4 presents the surface soil type map of the Flathead Valley in the vicinity of the Site. Based on the soil survey map and consistent with the Phase I Site Characterization findings, three major soil types are present at the Site: 1) glacial till (27-7), alluvium, and outwash as gravelly loam (Mh); 2) fluvial deposits and riverwash (Rc); and 3) partially mountainous land combined with glacial till (Mr and 75).

The glacial till and alluvium soil type is the predominant surface soil type at the Site. This soil type extends from the base of Teakettle Mountain along the eastern boundary of the Site through the western boundary of the Site. Fluvial deposits occur along the southern boundary of the Site and within the floodplain of the Flathead River. The Flathead River and other surface water bodies in the Flathead Valley are presented on Figure 5. The mountainous land and glacial till is apparent along Teakettle Mountain on the eastern boundary of the Site.

Based on the above described surficial geology and surface soil type reviews for the Flathead Valley and the Site, and the similarities in extent between the surficial geology and soil type, the following three primary soil types will be utilized for background soil reference areas; glacial till and alluvium, fluvial deposits and riverwash, and mountainous land with glacial deposits.

3.2 Soil Reference Area Selection

Soil type and soils derived from similar geologic sources are the primary consideration when choosing soil background reference locations. Similar soil types in background reference areas should demonstrate similar chemical and physical properties as the soil types on Site. This section describes the identified locations for soil reference areas based on the review of the soil type considerations described in Section 2.4.

Soil sampling will be conducted in three background reference areas, designated as Soil Background Reference Areas 1 through 3 below, are presented on Figure 6. The descriptions of each of the proposed soil sampling background reference areas are described below:

Soil Background Reference Area #1: Glacial Till and Alluvium

The glacial till and alluvium soil background reference area is located approximately $\frac{3}{4}$ of a mile south of the Site boundary and over one mile from the Main Plant area, and is accessed from a driveway Highway 2 East. The reference area is 11 acres of hilly, vegetated open land situated parallel to Highway 2 East. The area is bordered mostly by wooded and unoccupied land, with powerlines to the west and little surrounding commercial activity. The reference area is owned by CFAC, but no commercial/industrial operations or operations related to the aluminum plant took place on this property.

This offsite reference area was selected based on the similar glacial till and alluvium soil types at the Site. The majority of the Site surface soils consist of a layer of glaciofluvial and alluvial coarse-grained soils, varying in vertical extent and grain size depending on vicinity to Site features (i.e., Teakettle Mountain, Flathead River, etc.). Beneath the alluvium is a layer of dense, poorly sorted glacial till with interbedded deposits of glaciolacustrine clays and silts. The similar soil types should demonstrate similar chemical and physical properties as the soil types onsite. Evaluation of this location based upon aerial photo review and field reconnaissance determined that there is no readily apparent evidence of industrial or commercial

activities in this area. This location is upgradient of the prevailing wind direction in this area of the Flathead Valley and therefore has little potential to be affected by historic onsite operations.

Soil Background Reference Area #2: Fluvial Deposits and Riverwash

The fluvial deposits and riverwash soil background reference area is located approximately one-mile south of the Site boundary and over 1.5 miles from the Main Plant area, and is accessed from River Road off of Highway 2 East along the Flathead River. The reference area is approximately 68 acres of relatively flat and vegetated land with grass, shrubs, and trees. Based on the posted sign outside the Site and discussions with CFAC, this area is a Block Management Area (BMA), which is a Montana Fish, Wildlife, and Parks program that works with private landowners to allow public hunting. CFAC preserves this property for youth hunters and hunters that possess a permit to hunt from a vehicle. Although the area is owned by CFAC, no commercial/industrial operations or operations related to the aluminum plant took place on this property.

This offsite reference area was selected based on the soil being similar to the fluvial deposit soil types at the Site. The reference area contains fluvial deposits and riverwash located within the floodplain of the Flathead River. Evaluation of this location based upon aerial photo review and field reconnaissance determined that there is no readily apparent evidence of industrial or commercial activities in this area. This location is upgradient of the Site along the Flathead River, and upgradient of the prevailing wind direction in this area of the Flathead Valley and therefore has little potential to be affected by historic onsite operations and onsite overland flow.

Soil Background Reference Area #3: Mountainous Land with Glacial Deposits

The mountainous land with glacial deposits soil background reference area is located approximately ½ mile southeast of the Site boundary and ¼ of a mile southeast of the Main Plant area, and is accessed from Berne Road off Highway 2 East along the Flathead River between Columbia Falls and Hungry Horse. This reference area is considered the trailhead of Columbia Mountain, and extends approximately 1/8th of a mile into the trail past the parking lot. Reference soil samples will be collected from random locations approximately 10 to 20 feet off the worn trail path in the wooded and mountainous areas. The start of the trailhead is relatively flat, and changes in elevation from approximately 3083 ft to 3149 in the first 1/8th of a mile where the reference area is located. The trail also becomes more wooded and rocky with the increase in elevation. This offsite reference area was selected based upon its soil being similar to the mountainous land soil types at the Site along Teakettle Mountain and the eastern Site boundary. Evaluation of this location based upon aerial photo review and field reconnaissance determined that there is no readily apparent evidence of industrial or commercial activities in this area. This location is upgradient of the prevailing wind direction in this area of the Flathead Valley and therefore has little potential to be affected by historic onsite operations.

Proposed surficial soil background reference areas previously described are shown on Figure 6. As discussed further in Section 3.2, surficial soil sample locations in all three soil reference areas will be based upon a probabilistic simple random sample design.

3.3 Flathead River Considerations

The North Fork of the Flathead River originates in British Columbia and the Middle Fork of the Flathead River originates in the Bob Marshall Wilderness located south of Glacier National Park. The North Fork and the Middle Fork border Glacier Park on the western and southern boundaries, respectively, and flow south of Glacier National Park where they meet the South Fork of the Flathead River at the entrance of Badrock

Canyon, at which point the river is then called the Flathead River. The Flathead River flows west through Badrock Canyon towards Columbia Falls where its course turns southerly toward Flathead Lake (E&E, 1988). The Site is located within the Flathead Watershed. The Flathead Watershed includes all the land that drains into the Flathead River and Flathead Lake and beyond the lake to the confluence of the Flathead and Clark Fork Rivers (www.flatheadwatershed.org). The watershed covers approximately 200 miles of land from north to south and 90 miles from east to west. All surface water bodies in the Flathead Valley in the vicinity of the Site are presented on Figure 5.

Detailed information regarding the seasonal variability in the Flathead River, including discharge and temporal COPC concentration trends, is described in the Phase II SAP (Roux Associates, 2018). Surface water conditions in the Flathead Watershed vary seasonally. Snow is held as snowpack in the mountains during the winter months and melts in the spring. Annual peak flows in rivers and streams within the Flathead Valley typically occur in May and June, in response to snowmelt and direct precipitation. As the snow melts during the spring months, it recharges soil moisture and groundwater (www.flatheadwatershed.org). Groundwater in the region is typically recharged from the surface water sources within the watershed including numerous reservoirs, ponds, streams, and lakes and additionally through infiltration of precipitation. During high flow, the Flathead River recharges groundwater and acts as a losing stream. In contrast, in the late summer and fall, the dry weather results in a decrease in river stage so that the Flathead River becomes a gaining stream (Konizeski et al., 1968).

A result of the high flow of the Flathead River near the Site is that the shoreline bordering the Site contains little unconsolidated materials that meet the technical definition of sediment. As defined by USEPA, suspended and bedded sediments (SABs) are "particulate organic or inorganic matter that suspends in or are carried by the water, and/or accumulate in a loose, unconsolidated form on the bottom of natural water bodies" (USEPA, 2003). During Phase I sampling, Roux personnel utilized a probing rod and visual inspections to evaluate the presence of sediment. Accumulations of loose, unconsolidated, bedded sediments were only identified within the Backwater Seep Sampling Area and at one other sampling location within Flathead River. In locations where depositional sediment was found in the Flathead River, sediment samples were generally collected beneath the surface water at a distance of approximately three to five feet from the river bank. Samples were generally collected from the top inch of the depositional sediment. Reconnaissance and sampling of the area indicates that much of the shoreline and bottom of the Flathead River consists primarily of gravel and cobbles.

The Flathead River is a unique river in terms of its size, flow, and watershed capture area. A river comparable to the Flathead River is not present in the Flathead Valley, therefore, it was determined that the reference area for the Flathead River should be an upstream area within the river, since the surface water and sediments at such locations should not exhibit any impacts that are attributable to the Site. Upgradient Flathead River was also selected as representative surface water and sediment reference location to compare to the Site since this water body is wet year-round (whereas other surface water features at the Site such as the Northern Surface Water Feature are wet seasonally).

3.4 Flathead River Reference Area Selection

Background surface water and sediment samples for the Flathead River are proposed to be collected within the reference location identified on Figure 6. The reference area in the Flathead River is a reach of river beginning approximately ¼ mile upstream (east) of the Site and extending for a distance of approximately ¾ of a mile into Badrock Canyon. The reference area is approximately 100 acres; measuring ¾ of a mile long

and is 350 to 400 feet wide, similar to the width of the river directly south of the Site. This reach of the river has surface water and sediment characteristics that are similar to the reach of river within the Site where sediment and surface water samples are collected for the RI/FS. This reference area is not accessible by vehicle or by a road (bordered to the north by the rail line and to the south by Highway 2) and therefore would need to be accessed by boat.

Surface water and sediment sampling reference location #1 is located within the Flathead River and upgradient of the CFAC Site. Evaluation of this location based upon aerial photo review and field reconnaissance determined that there is no readily apparent evidence of industrial or commercial activities in this area. This location is upgradient of the Site along the Flathead River (east of the Site), and therefore has little potential to be affected by historic onsite operations and onsite overland flow. This location was also selected due to the similar physical characteristics of the shoreline between the reference location and the Site, including the presence of a bank and backwater area. As described in Section 2.7, the high-flow and rocky substrate of the Flathead River do not allow for frequently identified areas of depositional areas for sediment collection. Surface water and sediment samples in the Flathead River will be collected using a probabilistic, simple random sampling approach from those areas where sediment is observed. Sample locations will be identified and collected from depositional areas. If depositional areas are not frequently observed throughout the river, multiple sediment samples may be collected from areas of observed deposition.

3.5 Cedar Creek Considerations

Cedar Creek originates north of the Site in the Whitefish Mountains and flows approximately three miles southwest towards Columbia Falls. Cedar Creek Reservoir is located north of the Site. The Cedar Creek Reservoir Overflow Ditch which flows on the eastern boundary of the Site, flows intermittently in the spring and regulates flow for Cedar Creek and the Cedar Creek Reservoir. Based upon the flat topography of the portion of the Site located within one-half mile of Cedar Creek, there is little potential for surface water runoff from the industrialized portion of the Site into Cedar Creek. In addition, the elevation of Cedar Creek is higher than groundwater elevations within the Site, indicating that Cedar Creek is a losing stream rather than a gaining stream. According to the United States Geological Survey (USGS) National Hydrology Dataset, a tributary to Cedar Creek flows, or has flown historically, in the northern area of the Site, joining Cedar Creek approximately ½ mile to the southwest of the Industrial Landfill. Roux personnel conducted field reconnaissance to investigate the potential presence of this tributary and no tributary of Cedar Creek was identified in the northern area of the Site.

Detailed information regarding the seasonal variability in Cedar Creek, including discharge measured during each Phase I sampling event, is described in the GW/SW DSR (Roux Associates, 2017c). Discharge of Cedar Creek was measured utilizing a mechanical current-meter method four times during the Phase I Site Characterization (i.e., August 2016, November 2016, April 2017, and June 2017). The discharge varied from a minimum discharge of 4.52 ft³/s in August 2016 to a maximum of 19.94 ft³/s in June 2017. Similar to the Flathead River, sediment depositional areas were not observed throughout the entire stretch of Cedar Creek within the Site. Surface water and sediment samples in upgradient Cedar Creek will be collected using a simple random sampling approach from those areas where sediment is observed. Sample locations will be identified and collected from depositional areas. If depositional areas are not frequently observed throughout the river, multiple sediment samples may be collected from areas of observed deposition.

3.6 Cedar Creek Reference Area Selection

Background surface water and sediment samples for Cedar Creek are proposed to be collected within the reference location identified on Figure 6. The reference area in the headwaters of Cedar Creek is located more than two miles upgradient of the Site and is north of Cedar Creek Reservoir. The reference area spans for approximately 233 acres as the creek flows alongside Route 486 and is accessible in locations where the river and road run parallel or where the river intersects the road. The creek runs through the woods and is not surrounded by any commercial/industrials. The creek was observed vary between 15 and 25 feet wide and 3 to 5 feet deep in some locations, similar to the width and depth of Cedar Creek during the time of reconnaissance. The creek was also observed to have a similar flow rate to Cedar Creek during reconnaissance (although was not measured with a flow meter). Surface water and sediment were observed throughout the creek.

Surface water and sediment sampling reference location #2 is upstream of the Site within the headwaters of Cedar Creek. This location was selected due to its physical characteristics that are similar to Cedar Creek (as described in Section 3.6) at the Site. Within the reference area location, the stream is also a similar size stream (depth and width) to Cedar Creek adjacent to the Site and is expected to have a similar average discharge during high and low water seasons. The stream was also identified as having headwaters from the mountains and discharges into the Flathead River before Flathead Lake. Evaluation of this location based upon aerial photo review and field reconnaissance determined that there is no readily apparent evidence of industrial or commercial activities in this area. This location is upgradient of the Site and Cedar Creek Reservoir, therefore has little potential to be affected by historic onsite operations and onsite overland flow. Although this area is downgradient of the prevailing wind direction, it is significantly distant from the Site (2 miles from the Site boundary and approximately 3.5 miles from the former operational area of the Site). As described further in Section 2.5 and consistent with the Flathead River background sampling plan, surface water and sediment samples upgradient of Cedar Creek will be based upon a probabilistic, simple random sample design.

4. Background Investigation Field Sampling Plan

The Background Investigation Scope of Work was developed based on the Background SAP DQOs and objectives described in Sections 2.0, data requirements identified during preparation of the RI/FS Work Plan, the draft BERA and BHHRA Work Plans (EHS Support, 2017a, b), and the Phase II SAP (Roux Associates, 2018). The description of the basis for the sampling plan design is provided below, followed by a description of the sampling plan for the field activities planned for Background Investigation. The DQOs to support the field sampling plan design are provided in Section 2.0.

4.1 Field Sampling Plan Design

The Background Investigation soil, surface water, and sediment sample locations and numbers of sampling points will be selected based upon probabilistic sample design so that statistical inferences may be made about the sampled population. The use of simple random sampling will allow for a representative dataset such that sample locations within a reference area are equally likely to be chosen. Sampling locations in each reference area will be randomly generated in GIS to meet the probabilistic sampling design.

As previously described in Section 3.4, the high-flow and rocky substrate of the Flathead River do not allow for frequently identified areas of depositional areas for sediment collection. Therefore, sediment samples will be collected randomly in areas that have depositional sediment within the bounds of the reference areas described in Sections 3.4 and 3.6.

Although the results of the Phase I determined that cyanide, fluoride, PAHs, and select metals were considered primary COPCs at the Site, Roux is analyzing background soil, sediment, and surface water samples for full suites of SVOCs and metals in addition to cyanide and fluoride to provide a better understanding of these entire analyte groups and since the Phase II Site Characterization and final section of COPCs is not complete.

4.2 Background Investigation Field Activities

Preliminary background sample reference areas were selected considering the characteristics described in Sections 3.1, 3.3, and 3.5 above and considering the information collected during the Phase I Site Characterization. Preliminary selection of the reference areas was conducted by reviewing maps, aerial photographs, and existing data. The background sample reference areas are shown on Figure 6. The remainder of this Section describes the background sample reference areas and the field sampling plan that will be implemented to collect data from the background reference areas.

4.2.1 Offsite Reference Area Reconnaissance

Prior to conducting field activities associated with the background investigation, a detailed, ground-level reconnaissance of the preliminary selected background sample reference areas was performed. The objectives of the reconnaissance were to:

- Visually inspect the physical conditions of the potential reference areas to evaluate their suitability for the background study;
- Review the proposed sample locations in the field to ensure that the locations are accessible for sampling and determine equipment requirements for access to proposed sampling locations (if any); and
- Photo document the conditions of the sample reference areas.

The ground level field reconnaissance consisted of two Roux geologists visually inspecting and photo-documenting the conditions of each of the preliminary background sample reference areas. Proposed reference area locations were confirmed by the field personnel and georeferenced utilizing a handheld global positioning system (GPS). Field notes and photographs were collected to document all significant observations. Photos of the background reference areas are provided as Appendix A. As discussed in Section 3.4, the proposed reference area located upgradient in the Flathead River was not accessible by vehicle and there are no roads that access the bank. Therefore, photographs of this area in the river are not provided in Appendix A. Photographs of the river upgradient to the proposed reference area are provided for comparison.

4.2.2 Soil Sampling

Ten (10) soil samples are proposed in each background soil reference area to ensure enough samples are collected to calculate representative UCL_{means} and BTVs for each area. As described in Section 2.5, a probabilistic sampling design in soil was selected for this Background Study. The proposed reference areas for soil sampling is provided as Figure 6. Proposed sampling locations were selected by randomly generating sampling locations in the reference area using GIS.

At each proposed location, a discrete surface soil sample from 0 to 0.5 ft-bls will be collected. This depth interval is consistent with the surface soil samples collected as part of the Phase I Site Characterization and the surface sampling interval to be collected as part of the Phase II Site Characterization.

Surface soil samples will be collected with hand augers and/or other hand tools. All soil samples will be described in accordance with the Unified Soil Classification System (USCS). The samples will be examined for evidence of potential impacts (i.e., staining, odor) and screened for the potential presence of volatile organic carbons (VOCs) using a Photoionization Detector (PID) for consistency with the Phase I and Phase II Site Characterization activities. The location of each sample will be logged with GPS technology with sub-meter accuracy. The readings and GPS location will be recorded on a field datasheet and included as part of the Phase II DSR. A list of the analytical methods utilized for soil sample analysis is included in Section 4.4.

4.2.3 Surface Water Sampling

The proposed reference areas for surface water sampling are presented on Figure 6. Surface water sample collection will coincide with surface water sampling activities planned as part of the Phase II Site Characterization. Surface water samples will be collected once during high water season and once during low water season to evaluate the temporal variability of surface water quality within the reference area. Surface water samples will be collected by taking a grab sample directly from the water body using the sample collection container for each analysis. Samples will be collected at a depth of approximately 60 percent of the total water column depth and no greater than a maximum water depth of two feet. As part of sample collection activities within the surface water features, surface water will be field analyzed with a water quality meter to evaluate water quality parameters including temperature, conductivity, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP). The water quality meter will be placed directly in the surface water feature and will be monitored until stable readings are observed. The location of each sample will be logged with GPS technology with sub-meter accuracy. The readings and GPS location will be recorded on a field datasheet and included as part of the Phase II DSR. A list of the analytical methods utilized for surface water sample analysis is included in Section 4.4.

During both background surface water sampling events, the discharge of the stream in surface water and sediment reference area #1 will be measured utilizing a mechanical current-meter method in accordance with Roux Standard Operating Procedure (SOP) 6.7. The stream channel cross section will be divided into numerous vertical subsections. In each subsection, the area will be obtained by measuring the width and depth of the subsection, and the water velocity will be determined using a current flow meter. The discharge in each subsection will be computed by multiplying the subsection area by the measured velocity and the total discharge will be computed by summing the discharge of each subsection. Discharge of the Flathead River will continue to be evaluated using the USGS staff gauge (#12363000).

4.2.4 Sediment Sampling

Sediment samples will be collected from the same reference locations as surface water samples. The proposed reference areas for sediment sampling are presented on Figure 6. Sediment sample collection will coincide with sampling activities planned as part of the Phase II Site Characterization. Seasonal conditions and river stage will be taken into account when collecting sediment samples. Sediment sampling activities in the two reference locations will be performed in low water season (October/November 2018). During the low water season, the river stage is at a low level and the Flathead River is functioning as a gaining stream.

Sediment will be collected by grab sampling surface sediment from 0-0.5 ft immediately beneath the sediment-surface water interface, and placing in sampling jars for laboratory analysis. Gravel and larger sized grains will be removed from the sample by utilizing a size #10 sieve prior to packaging and shipment for laboratory analysis. If any proposed sediment locations are determined not to contain unconsolidated materials that meet the definition of sediment as defined by USEPA as “suspended and bedded sediments” (USEPA, 2003), the sediment sample location and associated surface water sample location will be moved within the vicinity of its originally proposed location, or a surface soil sample will be collected in its absence.

4.3 Field Sampling Procedures

Field sampling will be performed in accordance with SOPs in the Phase II SAP. This section discusses sample designation procedures that will guide the Background Investigation.

4.3.1 Sample Designation Procedures

Consistent with the Phase I and Phase II Site Characterization sample designation procedures, all screening locations and analytical samples, including samples collected for QA/QC purposes, will be given a unique Site-specific sample identification number. The sample identification number will be used to track field-screening data and laboratory analytical results in the project database, as well as for presentation of the data in memoranda and reports. During the investigation, the sample numbers will be recorded in the field logbook and field datasheets, on the sample jars, and on the chain of custody (COC) paperwork.

The Site-specific format will include the following structure:

1) Project Identification Code

All samples collected during the RI will be labeled as “CF” to represent “Columbia Falls” Aluminum Company.

2) Sampling Location Type

All samples will include an alpha identification code to identify the type of sample location:

- BSB = Background Soil Boring
- BSWP = Background Surface Water Point

- BSDP = Background Sediment Point

3) Sample Location Number

For Background Investigation sampling locations, each unique sample location will receive a unique numerical ID. Numerical IDs started with "001" for each sample location type.

4) Sample Media Type

All samples will include an alpha identification code to identify the type of sample media being collected:

- SO = Soil
- SW = Surface water
- SD = Sediment

5) Sample Interval

Only surficial samples are proposed for the Background Investigation. The sample identification will include the depth interval in feet below land surface from which the unique sample was collected (i.e., 0-0.5).

6) QA/QC Samples

For samples collected for quality assurance / quality control purposes, the following alpha identification codes will be added to the sample ID:

- MS = Matrix Spike
- MSD = Matrix Spike Duplicate
- FB = Field Blank
- EB = Equipment Blank
- DUP = Field Duplicate

Field duplicates and other QA/QC samples will also be given unique identifiers indicating the type of sample and the sample date, but the analytical laboratory will be kept "blind" as to the location of field duplicate pairs to avoid introducing any bias to the analytical process.

The proposed samples and sample designations are provided on Table 1. Below are example sample designations for various types of hypothetical samples:

An example designation for a background soil sample collected from 0-0.5 ft-bls at soil boring location 001:

CFBSB-001-SO-0-0.5

An example designation for a surface water collected from station 001:

CFBSWP-001-SW

4.4 Laboratory Analytical Methods

The proposed samples at each reference location are summarized on Table 1. Samples will be sent under chain-of-custody to TestAmerica Laboratories, Inc. in Edison, New Jersey, Burlington, Vermont, and Pittsburgh, Pennsylvania which are the laboratories that are utilized for the Phase II Site Characterization. Samples will be analyzed by TestAmerica for a range of analytical parameters utilizing the following methods:

Soil

- Target Compound List (TCL) SVOCs via USEPA Method 8270 Low Level (LL);
- Target Analyte List (TAL) metals via USEPA Method 6020A / 7471B;
- Total cyanide via USEPA Method 9012B;
- Fluoride via USEPA Method 9056A; and
- Soil samples will also be analyzed for pH in the field, in accordance with SOP 5.14.

Surface Water

- TCL total SVOCs via USEPA Method 8270 LL;
- Total TAL metals via USEPA Methods 6020A / 7470A;
- Dissolved TAL metals via USEPA Methods 6020A / 7470A;
- Total cyanide via USEPA Method 335.4;
- Free cyanide via USEPA Method 9016;
- General chemistry including fluoride via USEPA Method 300, alkalinity via USEPA Method 2320B, and total hardness via USEPA Method 2340C;
- Nutrients including total chloride and dissolved sulfate via USEPA Method 300.0, nitrate and nitrite as N via USEPA Method 353.2, ammonia nitrogen via USEPA Method 350.1, sulfide via USEPA Method 4500S2F, and orthophosphate as P via USEPA Method 9056A;
- Total suspended solids (TSS) and total dissolved solids (TDS) via Standard Method 2540D/C; and
- Total organic carbon (TOC) and dissolved organic carbon (DOC) via Lloyd Kahn Method.

Sediment

- TCL SVOCs via USEPA Method 8270 LL;
- TAL metals via USEPA Method 6020A / 7471B;
- Total cyanide via USEPA Method 9014;
- Fluoride via USEPA Method 9056A;
- TOC via the Lloyd Kahn Method;
- Grain size distribution (sieve and hydrometer) via American Society for Testing and Materials (ASTM) Method D422;
- Moisture content via ASTM Method D2216-90; and
- Bulk density via ASTM Method D-2937-04.

4.5. Background Investigation Reporting

The results of the background study will be compiled and presented as part of the Phase II Site Characterization Data Summary Report. The report will be submitted following completion of the Phase II Site Characterization. The report will include tables and maps to present the data collected as part of the Phase II Site Characterization field activities, including the background study. The report will also present statistical evaluations required to evaluate the decision and estimation statements presented in the Background SAP DQOs.

5. References

- Administrative Settlement Agreement and Order on Consent between CFAC and the United States Environmental Protection Agency, CERCLA Docket No. 08-2016-0002.
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- Roux Associates, 2016c. Investigation Derived Waste Management Plan, Columbia Falls Aluminum Company, LLC.
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Background Investigation
Sampling and Analysis Plan
Columbia Falls Aluminum Company

TABLE

1. Proposed Background Samples and Sample Designations

Preliminary - Under EPA and MDEQ Review

Table 1. Proposed Background Samples and Sample Designations
Columbia Falls Aluminum Company, Montana

[illegible]

Background Investigation
Sampling and Analysis Plan
Columbia Falls Aluminum Company

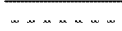
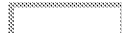
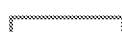
FIGURES

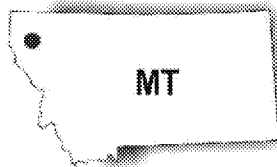
1. RI/FS Site Boundary
2. Site Features
3. Flathead Valley Surficial Geology
4. Flathead Valley Surface Soil Types
5. Flathead Valley Surface Water Bodies
6. Proposed Background Reference Sampling Areas

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LEGEND

-  CREEK FEATURES
-  SITE BOUNDARY
-  APPROXIMATE THIRD PARTY PROPERTY BOUNDARIES



Title:

RI/FS SITE BOUNDARY

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

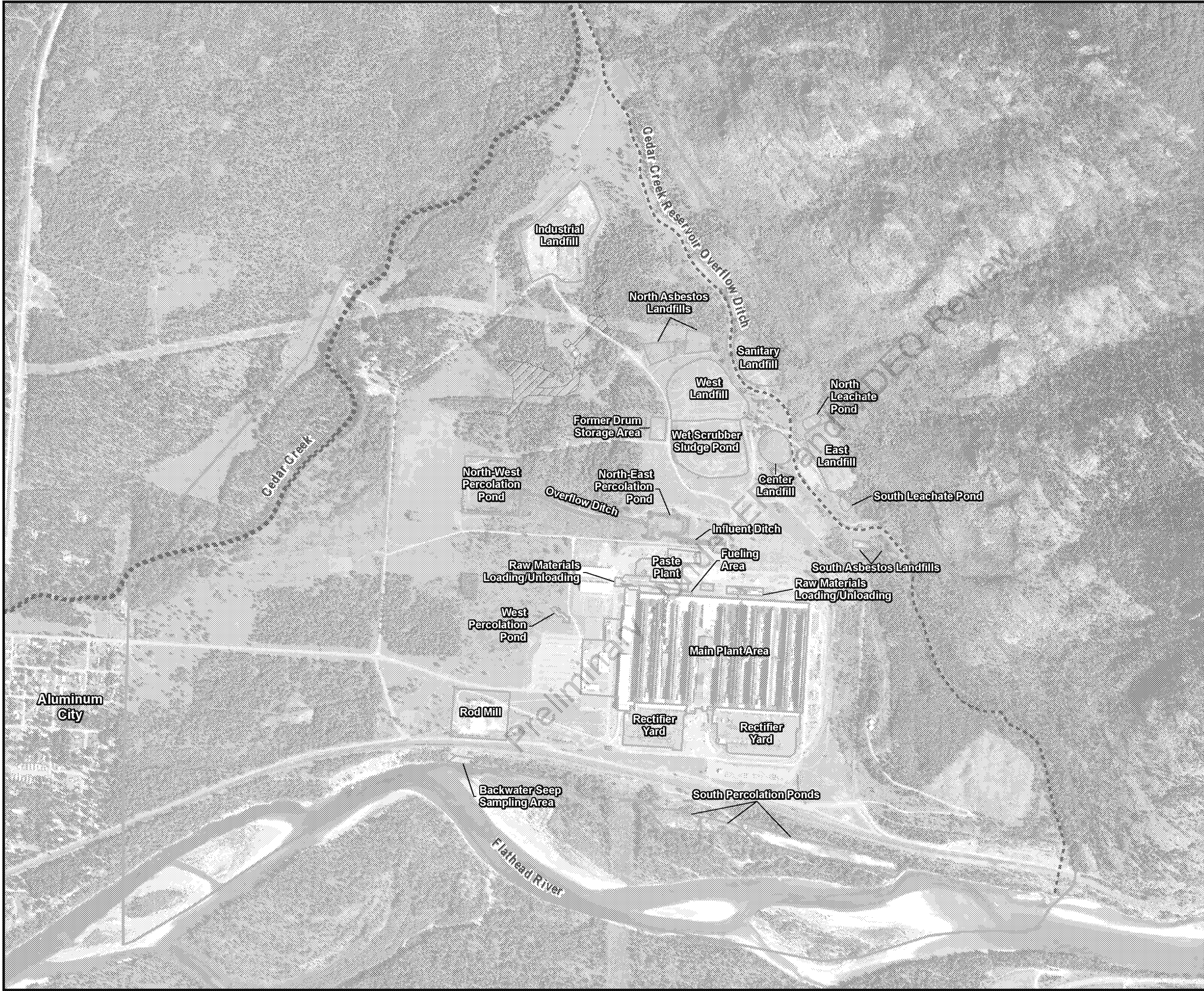
ROUX

Compiled by: MB.L.	Date: 21MAY18
Prepared by: M.S.R.	Scale: AS SHOWN
Project Mgr: L.J.	Project: 2476.0001Y005
File: 2476.0001Y207.1.mxd	

FIGURE

1

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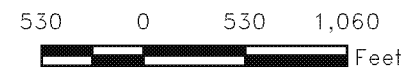
LEGEND

--- CREEK FEATURES

--- SITE FEATURES

--- NORTHERN SURFACE WATER FEATURE EXTENT

--- SITE BOUNDARY



Title:

SITE FEATURES

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTAN


Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX	Compiled by: L.J.	Date: 21MAY18	FIGURE 2
	Prepared by: M.S.R.	Scale: AS SHOWN	
	Project Mgr: L.J.	Project: 2476.0001Y006	
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2,500 0 2,500 5,000 Feet

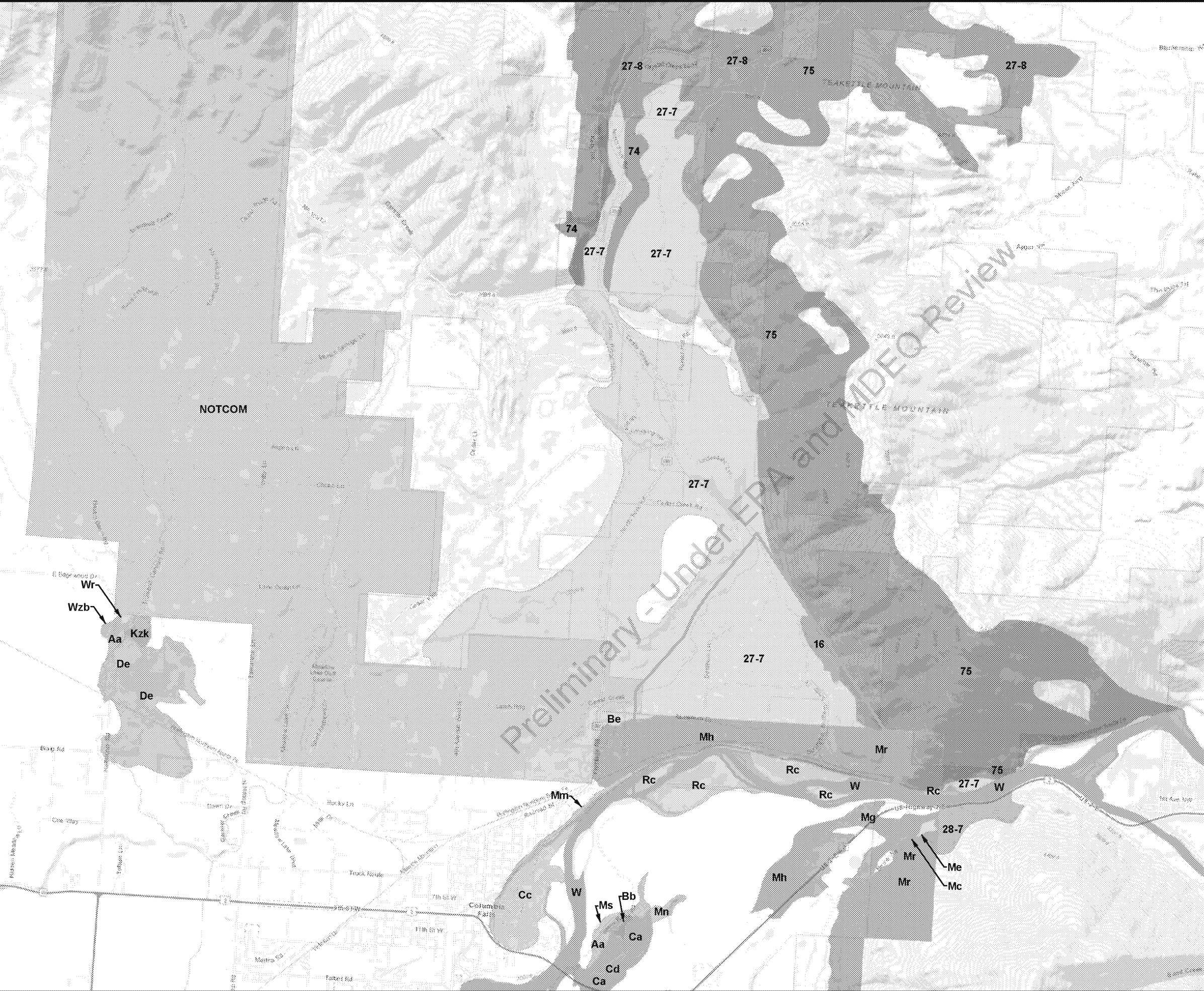
Title:
FLATHEAD VALLEY SURFICIAL GEOLOGY


2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTAN

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC


	Compiled by: L.J.	Date: 21MAY18	FIGURE 3
	Prepared by: M.S.R.	Scale: AS SHOWN	
	Project Mgr: L.J.	Project: 2476.0001Y006	
	File: 2476.0001Y207.3.mxd		

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LEGEND

 SITE BOUNDARY

PRIMARY SURFACE SOIL TYPES

16	ALLUVIUM
27-7	GLACIAL TILL
75	ROCK OUTCROP
Ca	SANDY ALLUVIUM
Cd	SILTY ALLUVIUM
De	GLACIOLACUSTRINE DEPOSITS
Mh	ALLUVIUM AND OUTWASH AS GRAVELLY LOAM
Mr	MOUNTAINOUS LAND AND GLACIAL TILL
Rc	FLUVIAL DEPOSITS AND RIVERWASH
W	WATER
NOTCOM	NO DIGITAL DATA AVAILABLE

SOURCE

UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL
RESOURCES CONSERVATION SERVICE SOIL SURVEY

3,650

0

3,650

Feet


Title:

FLATHEAD VALLEY SURFACE SOIL TYPES

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTAN

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

	Compiled by: L.J.	Date: 22MAY18	FIGURE 4
	Prepared by: M.S.R.	Scale: AS SHOWN	
	Project Mgr: L.J.	Project: 2476.0001Y006	
	File: 2476.0001Y207.4.mxd		

V:\GIS\Projects\2476\0001\207\2476.0001\207.5.mxd



LEGEND

SITE BOUNDARY

2,500 0 2,500 5,000 Feet

Title:

FLATHEAD VALLEY SURFACE WATER BODIES

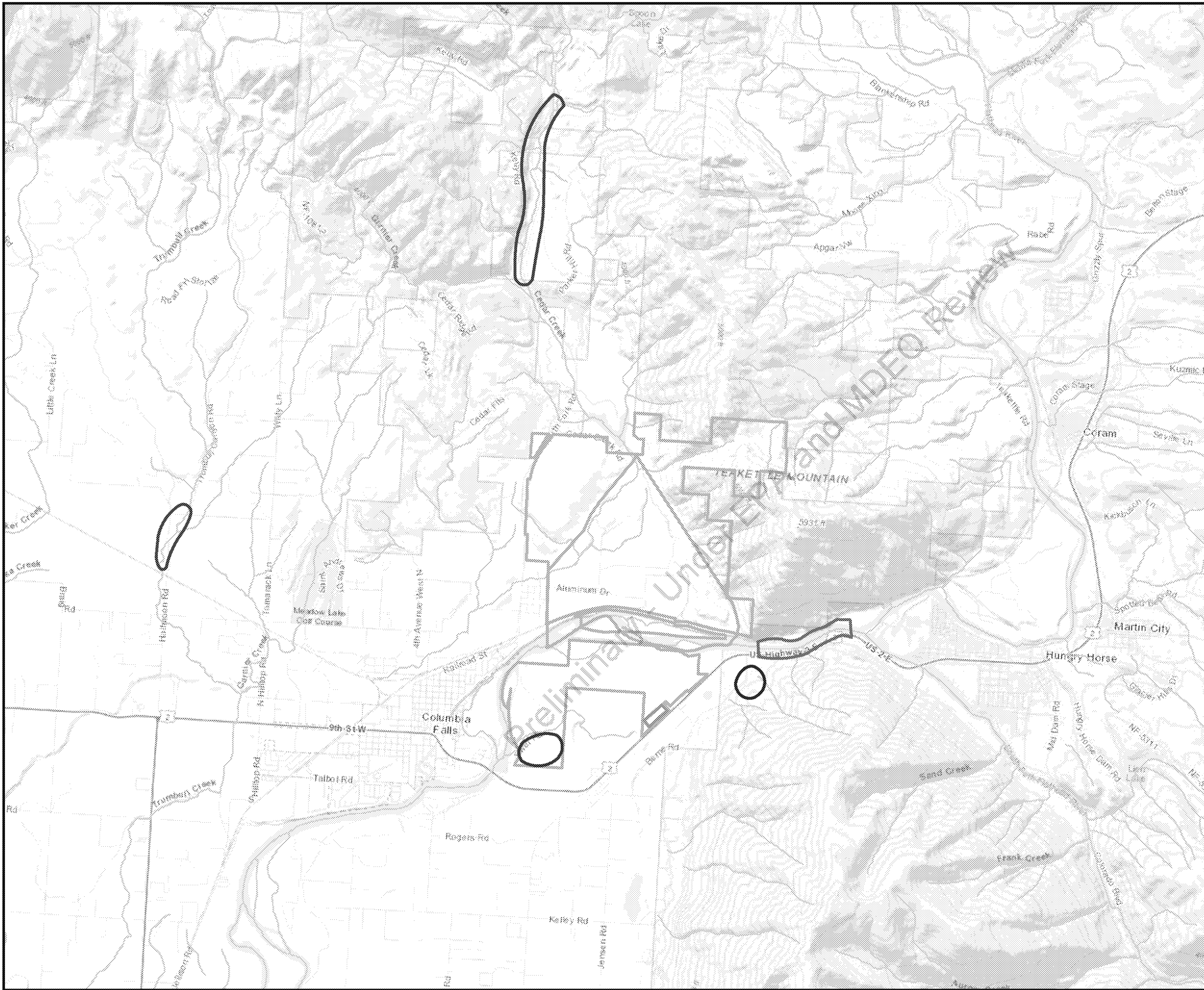
2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTAN

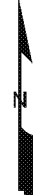
Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

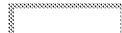
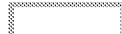
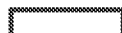



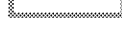
	Compiled by: L.J.	Date: 21MAY18	FIGURE 5
	Prepared by: M.S.R.	Scale: AS SHOWN	
	Project Mgr: L.J.	Project: 2476.0001Y006	
	File: 2476.0001Y207.5.mxd		

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LEGEND

-  SITE BOUNDARY
-  APPROXIMATE CFAC OWNED PROPERTY
-  PROPOSED SURFACE WATER/SEDIMENT BACKGROUND REFERENCE AREAS SIMILAR TO CEDAR CREEK
-  PROPOSED SURFACE WATER/SEDIMENT BACKGROUND REFERENCE AREA SIMILAR TO FLATHEAD RIVER
-  PROPOSED SOIL BACKGROUND REFERENCE AREA SIMILAR TO SITE MOUNTAINOUS LAND AND GLACIAL DEPOSITS
-  PROPOSED SOIL BACKGROUND REFERENCE AREA SIMILAR TO SITE FLUVIAL DEPOSITS AND RIVERWASH
-  PROPOSED SOIL BACKGROUND REFERENCE AREA SIMILAR TO SITE GLACIAL TILL/ALLUVIUM

2,500 0 2,500 5,000 Feet

Title: **PROPOSED BACKGROUND REFERENCE SAMPLING AREAS**
2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTAN

Prepared For: **COLUMBIA FALLS ALUMINUM COMPANY, LLC**

	Compiled by: L.J.	Date: 25MAY18	FIGURE 6
	Prepared by: M.S.R.	Scale: AS SHOWN	
	Project Mgr: L.J.	Project: 2476.0001Y006	
	File: 2476.0001Y207.6.mxd		

Background Investigation
Sampling and Analysis Plan
Columbia Falls Aluminum Company

APPENDIX A

Background Reference Area Reconnaissance Photographs

Preliminary - Under EPA and MDEQ Review

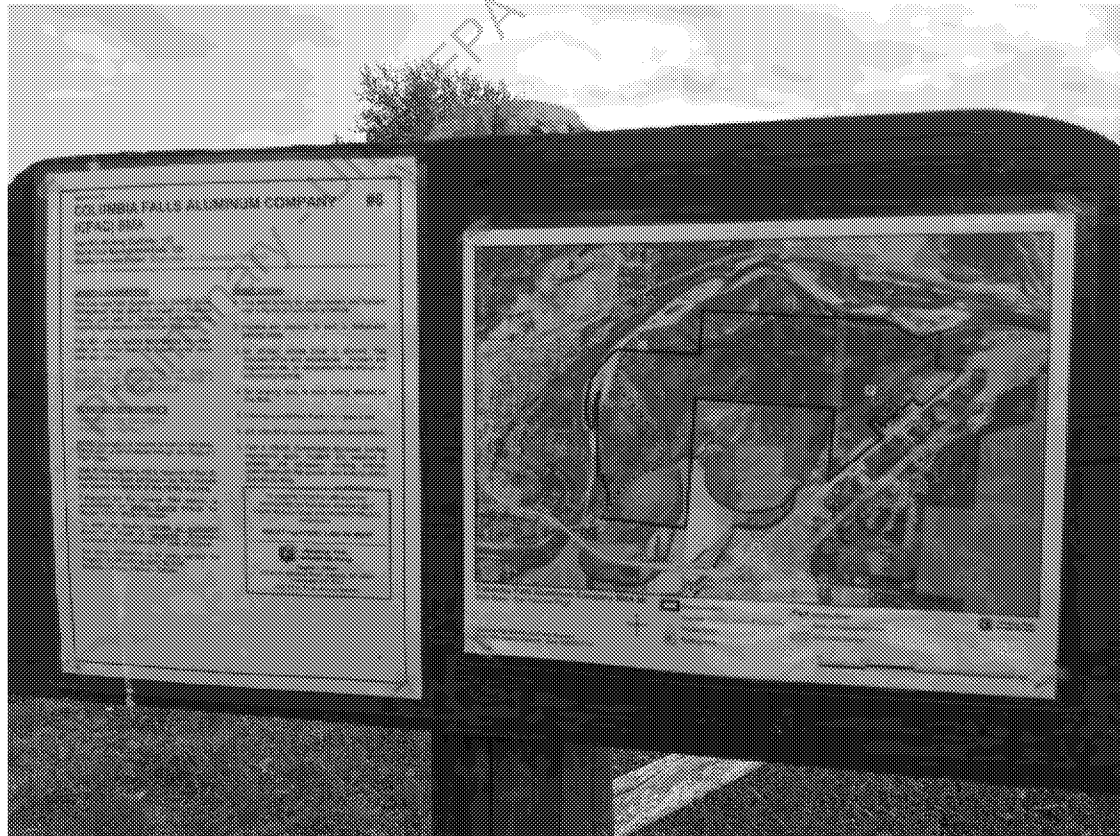


Photograph 1: Soil Background Reference Area #1: Glacial Till and Alluvium. Area is 11 acres of hilly, vegetated open land situated parallel to Highway 2 East; Photograph taken May 2018.



Photograph 2: Soil Background Reference Area #1: Glacial Till and Alluvium. Area is 11 acres of hilly, vegetated open land situated parallel to Highway 2 East; Photograph taken May 2018.

Photograph 3: Soil Background Reference Area #2: Fluvial Deposits and Riverwash. Area is 68 acres of relatively flat and vegetated land with grass, shrubs, and trees located along River Road. Photograph taken May 2018.



Photograph 4: Soil Background Reference Area #2: Fluvial Deposits and Riverwash. Sign posting for Block Management Area (BMA) for hunting. Photograph taken May 2018.

Photograph 5: Soil Background Reference Area #3: Mountainous Land with Glacial Deposits. Area is Columbia Mountain Trail Head on Berne Road off of Highway 2 East along the Flathead River between Columbia Falls and Hungry Horse. Approximately 100 feet into trail. Photograph taken May 2018.



Photograph 6: Soil Background Reference Area #3: Mountainous Land with Glacial Deposits. Area is Columbia Mountain Trail Head on Berne Road off of Highway 2 East along the Flathead River between Columbia Falls and Hungry Horse. Photograph taken at trailhead in May 2018.

Photograph 7: Surface Water and Sediment Sampling Reference Location #1. Flathead River (South Fork of the River). Actual reference area is not accessible by road. Photograph taken May 2018.



Photograph 8: Surface Water and Sediment Sampling Reference Location #1. Flathead River (South Fork of the River). Actual reference area is not accessible by road. Photograph taken May 2018.

Photograph 9: Surface Water and Sediment Sampling Reference Location #2. Headwaters of Cedar Creek off Route 486. Photograph taken May 2018.



Photograph 10: Surface Water and Sediment Sampling Reference Location #2. Headwaters of Cedar Creek off Route 486. Photograph taken May 2018.